Does Language reflect Affordances?

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Outline

1. Introduction

2. Purpose of the study

3. Methods

4. Results

5. Conclusions

Affordances

❑   "Possibilities for action", in James Gibson's view

❑   "It implies the complementarity of the animal and the environment" (James J. Gibson 1979: 127)

From affordances to canonical neurons:

❑   Neurons that fire when subjects act upon objects, as well as when they passively observe objects

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Perceived objects automatically activate affordances, intended as **the motor information incorporated in the object representation**

(e.g. Grèzes et al. 2003; Ellis and Tucker 2000; Tucker and Ellis 2001)

Studies on **object grasping and manipulation** show that the recruitment of the sensory-motor system caused by visually presented stimuli is modulated by a number of factors:

❑ Objects' typology: e.g. natural kind vs. artefacts; artefacts vs. geometrical shapes (cf. Grèzes et al. 2003b, Gentilucci 2002)

❑ Affording parts and their orientation (Tucker and Ellis 1998, 2001; Ellis and Tucker 2000; Phillips and Ward 2002; Grèzes et al. 2003; Symes et al. 2007; Buccino et al. 2009)

Do objects' properties affect linguistic behaviour,

as they modulate sensory-motor responses?

———

Does language reflect affordances?

Data collection

Participants: 30 students

Visual stimuli: 42 pictures

Objects represented: 33 graspable entities
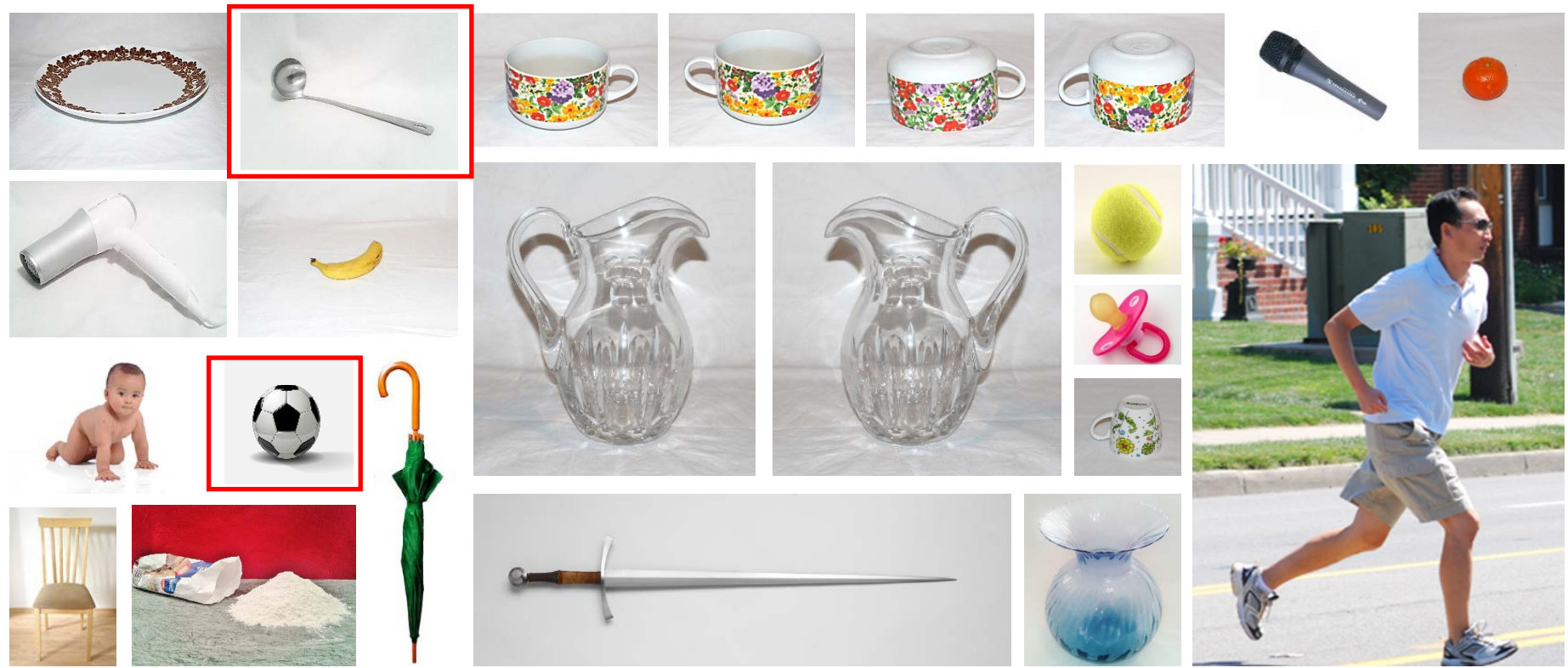
➢ Typology

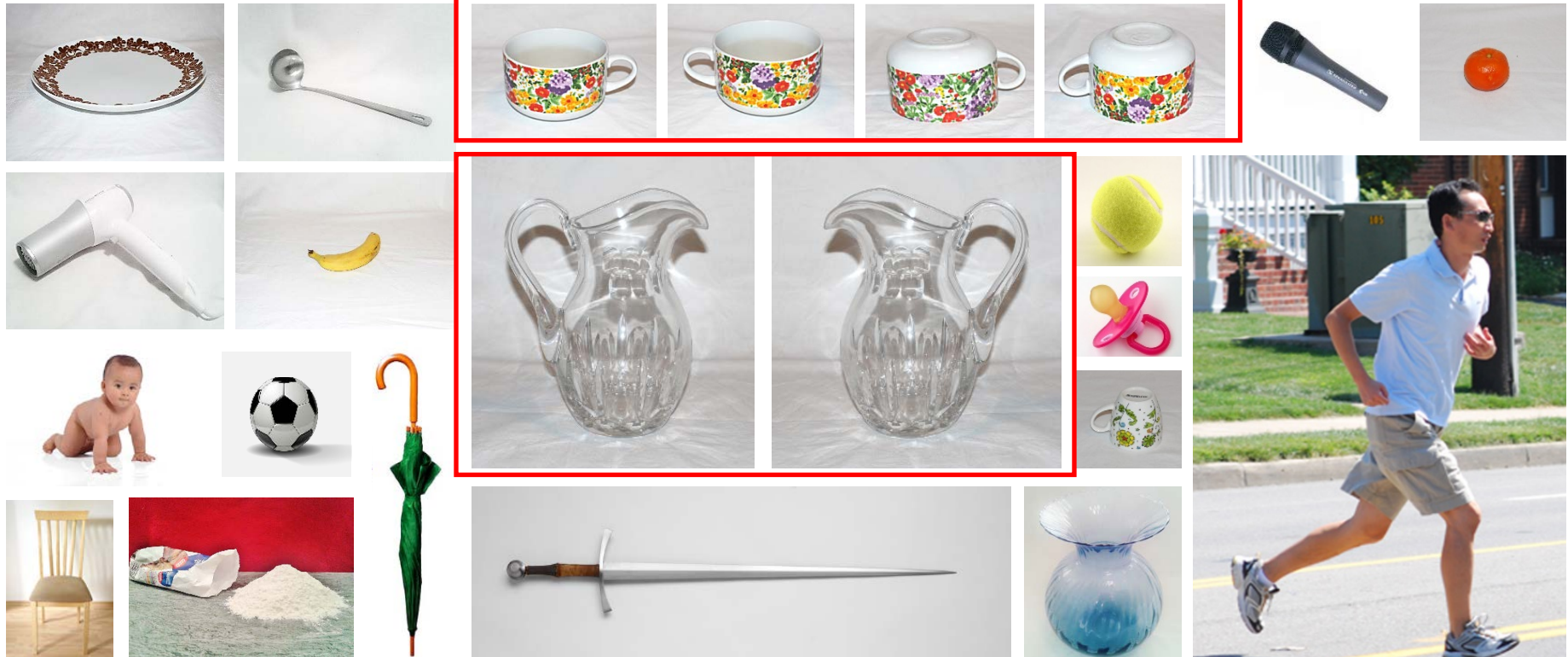artefacts   natural kinds   substances/aggregates   humans

➢ Artefacts

with or without affording parts

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LETTERATURA E LINGUISTICA

➢ Artefacts

leftward/rightward oriented; upright/overturned

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Transcriptions: CHAT standard format

Data annotation

The concept of affordance is an inherently relational one - it takes into account both the **agents**' abilities and the **objects**' physical properties

*009: in questo caso // credo che sì / prenderei il manico // con la

mano destra //

Effector

the entity that is linguistically presented as

the one that comes in contact with the object

Target

the part of the object-stimulus where the contact

with the effector is described to occur

14

Data annotation

*009: in questo caso // credo che sì / prenderei il manico // con la mano destra //

Transcript	Effector	Target
*018: allora // questa / con la **mano sinistra** afferrerei il [/] il **manico** //	Yes	Yes
*015: eh / questo // dal **manico** // sì dall'**impugnatura** //	No	Yes
*013: con le **mani** //	Yes	No

Tot. 1260 descriptions

The semantic classification of effector-related words   Tot. 2025

1. **Hand**   mano ("hand"), mani ("hands")
   2. **Meronym**   dita ("fingers"), palmo ("palm"), pollice ("thumb")
   3. **Holonym**   braccio ("arm"), braccia ("arms")
   4. **Space**   destra ("right"); sinistra ("left")
   5. **Perceptive**   concavo ("concave")
   6. **Quantity**   due ("two"); tutto ("whole"/"all")
   7. **Similes** (and metaphors) cucchiaio ("spoon")
8. **Other body part**   piede ("foot"), bocca ("mouth")
9. **Instrument**   bicchiere ("glass"), tazza ("cup")

The semantic classification of target-related words   Tot. 1520

1. **Entity**   brocca ("jug"), tazza ("cup")
   2. **Meronyms**   picciolo ("stalk"), manico ("handle")
   3. **Space**   (parte) superiore ("upper"), lateralmente ("laterally")
   4. **Quantity**   due ("two"), tutto ("all")
   5. **Perceptive** rosso ("red"), tondo ("rounded")
   6. **Similes** (and metaphors) come la sabbia ("as the sand")
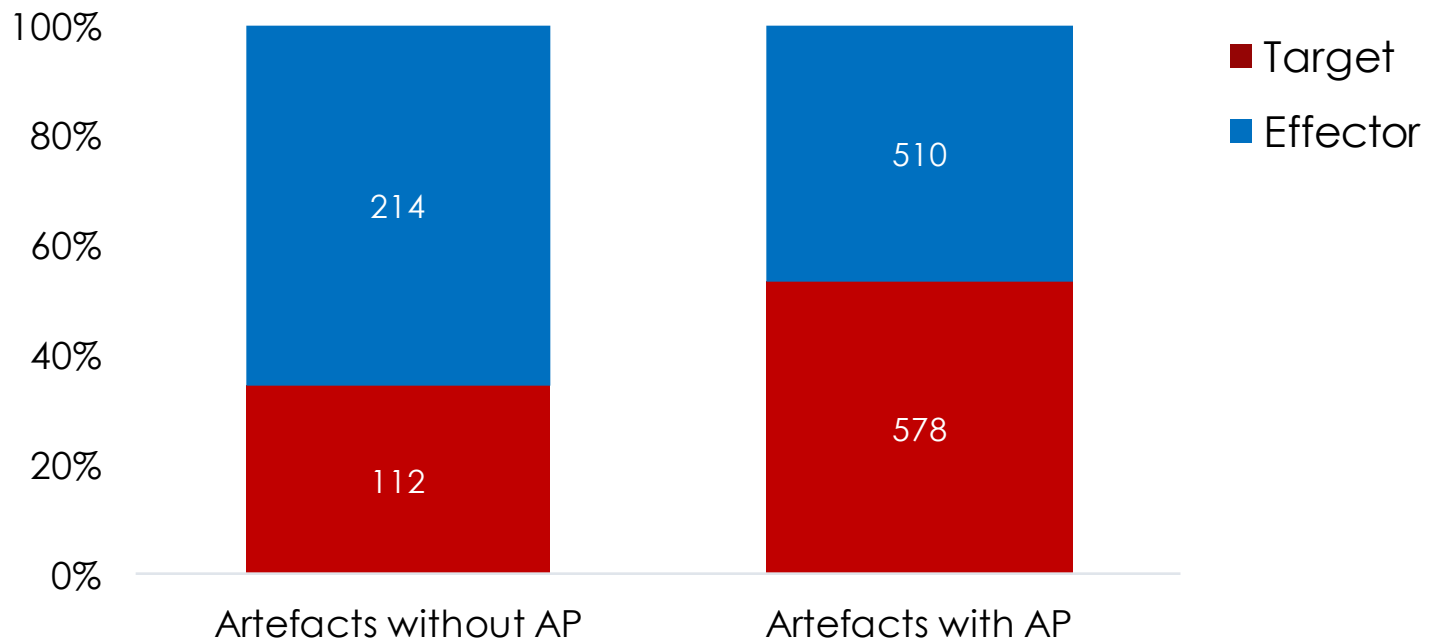   7. **Associated entity**   borsa ("bag"), sciarpa ("scarf")

References to the target and the effector

Artefacts

❑ Without affording parts: 8 objects-stimuli

❑ With affording parts (no different orientation): 7 objects-stimuli

❑ With affording parts and different orientation: 8 objects, 16 stimuli

References to the target and the effector

Artefacts - the presence of affording parts

$\chi^2(1, N=1414)=35.367, p<0.001$

References to the target and the effector

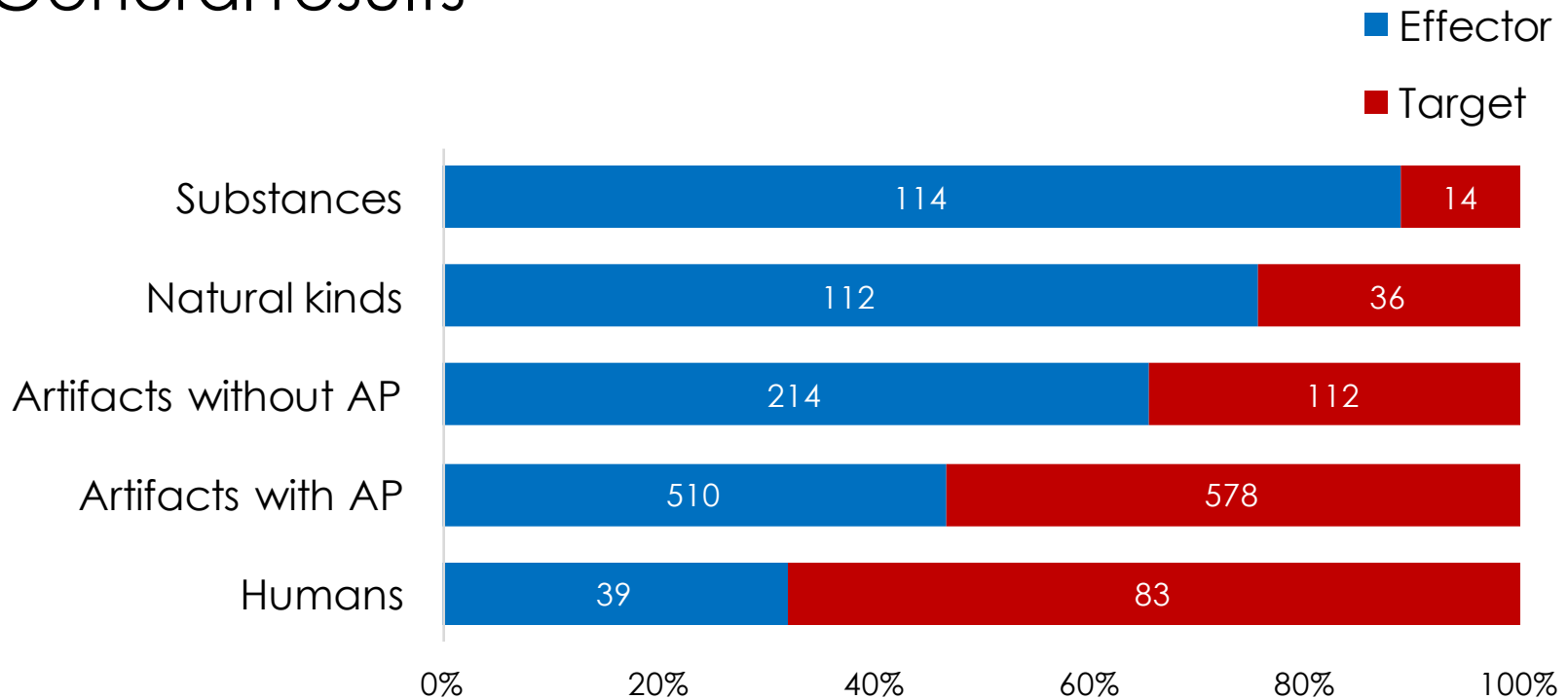## Artefacts - object orientation and hand dominance

	Target	Effector
+ Spatial alignment	**200**	185
- Spatial alignment	190	**191**

$\chi^2(1, N=766)=0.331, p=0.565$

References to the target and the effector

General results

$\chi^2(4, N=1812)=155.3$, $p<0.001$

General results

HUMANS > ARTEFACTS +AP > ARTEFACTS -AP > NATURAL KINDS > SUBST./AGGR.

➢ The more the object-stimulus is on the left part of this hierarchy, the more likely the target of the grasp is to be named, and the less likely the effector of the grasp is to be mentioned

➢ Informants' answers reflect shifts of attention from the agent-side to the object-side with relation to different categories of stimuli

The semantic classification of effector-related words

The reference to the hand (percentage values):

	hnd	mer	hol	obp	spa	perc	qua	spp	ins
Humans	45	10.1	7.2	-	-	-	37.7	-	-
Artefacts with AP	38	27.9	0.9	0.1	12.1	-	20.8	0.2	-
Artefacts without AP	34.5	27.7	1.7	-	4.4	-	31.7	-	-
Natural kinds	43.6	25.7	-	0.5	4.5	-	25.7	-	-
Substances/Aggregates	39.2	20.4	-	-	4.4	0.4	20.4	13.6	1.6
Tot.	38.1	26.1	1.1	0.1	8	0.1	24.6	1.7	0.2

The semantic classification of target-related words

Meronyms and spatial relations (percentage values):

	ent	mer	spa	qua	per	spp	aen
Humans	2.2	67.5	24.4	-	-	-	5.9
Artefacts with AP	7.4	47	41.1	0.8	2.1	1.6	-
Artefacts without AP	17.2	5.6	68.8	3.7	4.2	0.5	-
Natural kinds	14.3	10.7	46.4	6	1.2	21.4	-
Substances/Aggregates	21.1	4.2	19.7	47.9	-	7.1	-
Tot.	9.3	39	42.9	3.6	2	2.7	0.5

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❑   Within the category of artefacts, the target is explicitly indicated more often for artefacts provided with affording parts, than for artefacts without affording parts

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❑   The target of the grasp is named in most grasp descriptions provided for artefacts and humans. It is much less frequently mentioned for substances and natural objects

Linguistic behaviour seems to be influenced by the same factors that behavioural and neurophysiological researches indicate as able to modulate sensory-motor responses

❑ an object's typology

❑ the presence of affording parts

Describing an action requires an *imagery process,* during which **the experience of concrete interactions with objects is re-enacted**

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Something comparable to what happens when action simulations are automatically triggered by object perception

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The semantic classification of effector-related words

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Artefacts' orientation and effector-related words (spatial expressions):

	Right-handed		Left-handed	
	"destro"	"sinistro"	"destro"	"sinistro"
Rightward-oriented	**24**	1	**6**	4
Leftward-oriented	18	**34**	4	**10**